

TMDL Calculations for San Diego Creek - Loading Capacity

Flow Tier	Duration (days)	Flow* (cfs)	Log of Sediment Yield	Sediment** Yield (t/day)	Sediment Concentration						
					C <sub>s</sub> (mg/L)						
Base & Low	352	15	0.54996	3.548	97						
Medium	10	365	3.18865	1544	1729						
High	3	1595	4.29099	19543	5008						
Target Conc. in Sediment***					Partition Coefficient	Dissolved Fraction (f <sub>d</sub> ) Low Flow	Dissolved Fraction (f <sub>d</sub> ) Medium Flow	Dissolved Fraction (f <sub>d</sub> ) - High Flow	Particulate Fraction (f <sub>p</sub> ) Low Flow	Particulate Fraction (f <sub>p</sub> ) Medium Flow	Particulate Fraction (f <sub>p</sub> ) High Flow
		Log K <sub>oc</sub>	f <sub>oc</sub>	K <sub>d</sub> (m <sup>3</sup> /g)							
Total DDT	6.98	6.48	0.01	0.03020	0.2551	0.0188	0.0066	0.7449	0.9812	0.9934	
Chlordane	4.5	6.21	0.01	0.01622	0.3894	0.0344	0.0122	0.6106	0.9656	0.9878	
Dieldrin	2.85	5.31	0.01	0.00204	0.8352	0.2207	0.0891	0.1648	0.7793	0.9109	
Toxaphene	0.1	5.4	0.01	0.00251	0.8046	0.1872	0.0736	0.1954	0.8128	0.9264	
Total PCBs	34.1	6.15	0.01	0.01413	0.4227	0.0393	0.0139	0.5773	0.9607	0.9861	
	CCC (Chronic Criterion) (μg/L)	CMC (Acute Criterion) (μg/L)	Concentration**** in Water Col. C <sub>w</sub> (μg/L) Low Flow	Concentration in Water Col. C <sub>w</sub> (μg/L) Medium Flow	Concentration in Water Col. C <sub>w</sub> (μg/L) High Flow	Selected Value CTR vs. Cw (μg/L) Low Flow	Selected Value CTR vs. Cw (μg/L) Medium Flow	Selected Value CTR vs. Cw (μg/L) High Flow			
Total DDT	0.0010	1.1000	0.0009	0.0123	0.0352	0.0009	0.0010	0.0352			
Chlordane	0.0043	2.4000	0.0007	0.0081	0.0228	0.0007	0.0043	0.0228			
Dieldrin	0.0560	0.2400	0.0017	0.0063	0.0157	0.0017	0.0063	0.0157			
Toxaphene	0.0002	0.7300	0.00005	0.0002	0.0005	0.00005	0.0002	0.0005			
Total PCBs	0.0140	---	0.0057	0.0614	0.1732	0.0057	0.0140	0.1732			
	Loading Capacity (g/yr) Low Flows	Loading Capacity (g/yr) Medium Flows	Loading Capacity (g/yr) High Flows	Total Loading Capacity (g/yr)							
Total DDT	11.70	8.93	411.84	432.46							
Chlordane	9.20	38.39	267.01	314.61							
Dieldrin	21.59	56.46	183.39	261.43							
Toxaphene	0.64	1.79	6.33	8.75							
Total PCBs	73.75	124.99	2027.02	2225.76							

\*Flows were determined from stream gaging data at San Diego Creek & Campus Drive for years 1977-1997

\*\*Sediment Yield was determined from the regression equation taken from the RMA 1997 report to ACOE on the feasibility study for Upper Newport Bay restoration. The equation is log(y) = -0.09(log(x)^2) + 2.24(log(x)) - 1.96, where y = sediment (tons/day) and x is flow (cfs)

\*\*\*Sediment target values are equal to the threshold effect levels (TELs) from the NOAA Sediment Screening Quick Reference Tables (SQuiRTs) (Buchman, 1999).

\*\*\*\*Most conservative numbers are to be used in calculating loading capacity.

Calculated water column concentrations (C<sub>w</sub>) for low and medium flows were compared to CTR chronic criteria, and high flows were compared with CTR acute criteria. There is no CTR acute criterion for PCBs; therefore calculated Cw for high flows were used to determine loading capacity for PCBs.

1. Use sediment yield (tons/day) to calculate C<sub>s</sub> = suspended sediment concentration (mg/L)  
Example: (3.548 tons/day \* 1000 kg/ton \* 1000 g/kg \* 1000 mg/g) / (15 ft<sup>3</sup>/sec \* 86400 sec/day \* 28.31 L/ft<sup>3</sup>) = 97 mg/L
2. Use calculated C<sub>s</sub> values and partition coefficients (K<sub>d</sub>) to calculate the dissolved fraction (f<sub>d</sub>) for each contaminant. f<sub>d</sub> values are normalized to a TOC of 1%. K<sub>d</sub> (m<sup>3</sup>/g) = K<sub>oc</sub> (L/kg) \* f<sub>oc</sub> / 10<sup>6</sup> and f<sub>d</sub> = 1 / (1 + K<sub>d</sub> \* C<sub>s</sub>)
3. Use calculated f<sub>d</sub> values to calculate the particulate fraction (f<sub>p</sub>) for each contaminant. F<sub>p</sub> = 1 - f<sub>d</sub>
4. Calculate total pollutant concentration in the water column (C<sub>w</sub>), based on 1-3, above. C<sub>w</sub> = C<sub>t</sub> \* C<sub>s</sub> \* (1 / F<sub>p</sub>) \* 10<sup>-6</sup>
5. Calculate loading capacity (using either calculated aqueous concentrations or CTR concentrations, as applicable)  
Load (g/yr) = C<sub>w</sub> \* Q \* 28.31 \* 86400 \* #days of flow (Q<sub>d</sub>) \* 10<sup>-6</sup>